

**What is claimed is:**

1. A process for coating a surface of a component of semiconductor processing equipment, the process comprising:

depositing a cerium oxide containing ceramic layer on a surface of a component of semiconductor processing equipment, wherein the cerium oxide containing ceramic layer comprises one or more cerium oxides as the single largest constituent thereof and wherein the cerium oxide containing ceramic layer forms an outermost surface of the component.

2. The process according to Claim 1, wherein the cerium oxide comprises Ce(III) oxide and/or Ce(IV) oxide.

3. The process according to Claim 1, wherein the ceramic layer is applied by a technique selected from the group consisting of sputtering, sputter deposition, immersion coating, chemical vapor deposition, electron beam evaporation and condensation, physical vapor deposition, hot isostatic pressing, cold isostatic pressing, compression molding, casting, compacting and sintering, plasma spraying, and thermal spraying.

4. The process according to Claim 1, wherein the component is selected from the group consisting of a plasma chamber wall, a chamber liner, a gas distribution plate, a gas ring, a pedestal, a dielectric window, an electrostatic chuck and a focus ring.

5. The process according to Claim 1, wherein the ceramic layer is deposited to a thickness ranging from about 0.001 to about 0.050 inches.

6. The process according to Claim 1, further comprising depositing an intermediate layer on the surface of the component and depositing the ceramic layer on the intermediate layer.

7. The process according to Claim 1, further comprising subjecting the surface to a surface roughening treatment prior to depositing the ceramic layer, the ceramic layer being deposited on the roughened surface.

8. The process according to Claim 7, wherein the surface is aluminum, the process further comprising anodizing the roughened surface before depositing the ceramic layer.

9. The process according to Claim 8, further comprising subjecting the anodized surface to a surface roughening treatment prior to depositing the ceramic layer

10. The process according to Claim 1, wherein the surface is a metal surface.

11. A component of semiconductor processing equipment, the component comprising a cerium oxide containing ceramic material forming an outermost surface of the component, wherein the cerium oxide containing ceramic material comprises one or more cerium oxides as the single largest constituent thereof.

12. The component according to Claim 11, wherein the cerium oxide containing ceramic material comprises a ceramic layer on a substrate.

13. The component according to Claim 12, wherein the substrate comprises aluminum.

14. The component according to Claim 13, wherein the aluminum substrate has an anodized surface and the ceramic layer is disposed on the anodized surface.

15. The component according to Claim 12, wherein the ceramic layer has a thickness in a range from about 0.001 to 0.050 inches.

16. The component according to Claim 11, wherein the component comprises a part exposed to a plasma environment or a part exposed to bias voltages associated with a plasma environment.

17. The component according to Claim 11, wherein the component comprises a bulk part consisting essentially of the cerium oxide containing ceramic material.

18. The component according to Claim 11, wherein the component is selected from the group consisting of a plasma chamber wall, a chamber liner, a gas distribution plate, a gas ring, a pedestal, a dielectric window, an electrostatic chuck and a focus ring.

19. The component according to Claim 11, wherein the cerium oxide comprises Ce(III) oxide and/or Ce(IV) oxide.

20. A method of processing a semiconductor substrate in a plasma chamber containing the component of Claim 11, the method comprising contacting an exposed surface of the semiconductor substrate with plasma.

21. A method of manufacturing a component of semiconductor processing equipment constructed from a cerium oxide containing ceramic material comprising the steps of:

preparing a slurry comprising a cerium oxide containing ceramic material;  
forming a green compact from the slurry in the desired shape; and  
sintering the green compact to form a cerium oxide containing ceramic component;

wherein the cerium oxide containing ceramic component comprises one or more cerium oxides as the single largest constituent thereof.

22. A component of semiconductor processing equipment manufactured by the method of Claim 21.

23. The method according to Claim 21, wherein the cerium oxide comprises Ce(III) oxide and/or Ce(IV) oxide.